AGASSIZ'S WORK ON THE EMBRYOLOGY OF THE TURTLE.

GERTRUDE C. DAVENPORT.

AGASSIZ'S *Embryology of the Turtle* — the second volume in the series of *Contributions to the Natural History of the United States of America* (1857) — was for its time, and still remains in these days of refined histological technique, a beautiful and useful research. The scope of the book is broad. Stages in the development of the turtle are described, beginning with the most immature eggs in the ovary and continuing through many embryonic phases until the young turtle hatches out.

In addition to the great contribution to embryological knowledge which this book brought, it also contained much information of a sort too often unobserved or omitted by embryological investigators of to-day; namely, the habits, especially the breeding habits, of the animals studied.

Even to the present time we have almost no other printed accounts and none so complete to which we can turn for information in regard to the breeding time of and the number of eggs deposited by our commoner American turtles. Indeed, until Agassiz's time, and even to-day, it is believed by many that turtles lay in the fall as well as the spring. By careful observation upon turtles kept in comparative freedom and upon those in a wild state, Agassiz found that turtles deposit eggs once a year, normally in the months of May and June, the time depending upon the kind of turtle in question. Moreover, he determined the age at which various kinds of turtles begin to lay eggs and the time necessary for their hatching. These are only a few of the many interesting and useful facts regarding the life history of the turtle which this volume contains.

Agassiz's studies of ovarian eggs likewise disclosed many new facts. For example, the period of growth of ovarian eggs was determined. Ovarian eggs develop in sets corresponding in number to that of each laying. From the size and appearance of these ovarian sets, Agassiz was able to say

positively in what order at least four of the sets would be laid. His studies of ovarian eggs were, on the whole, excellent for his time, but his ideas in regard to yolk spheres differ considerably from those held to-day.

For our knowledge of segmentation stages we are indebted to Agassiz alone. Although the segmentation stages drawn in his beautiful plates or described by him do not form a complete series, nevertheless they remain the only ones observed by reptilian embryologists.

The next stage figured and described is that now generally known as the stage of the embryonic shield. The figures of this stage are beautiful and accurate, but what is now known to be the invagination of the primitive gut was mistaken for the beginning of the head development; in other words, the posterior end of the shield was mistaken for the anterior end.

Many individuals and stages in the subsequent embryological development are figured, and helpful descriptions of surface views are given. Those figures showing the vitelline and allantoidian circulations deserve especial mention.

The chapter and figures devoted to the development of organs contain much that is still useful to us. Indeed, his results are marvelous when we compare the methods of investigators of that day with those of our own. For we must remember that in Agassiz's time, imbedding in paraffin, the microtome, and, consequently, methods of reconstruction from sections were unknown. On the other hand, this absence of modern technique renders the chapter devoted to histology, however good for its time, of little scientific value for us to-day.

Eight plates are devoted to figures of the eggs and recently hatched embryos of all the commoner North American species of turtles. So accurately are these drawn that one can with certainty identify the species from the egg or newly hatched young. These plates alone render the work indispensable.

It is a tribute to the zeal and thoroughness of Agassiz and his helpers in this work that after forty years it stands to-day with its many unverified facts as an incentive to the reptilian embryologist to confirm and extend the work so magnificently begun.